

wherein the reflection means and the lenses are used to form, in the corresponding image-capturing regions, separate images of said subject which are captured from different viewpoints having a distance therebetween.

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REMARKS

Claims 1-7 are pending in the application. In the Office Action of December 16, 2002, the Examiner made the following disposition:

- A.) Rejected claim 7 under 35 U.S.C. §112, second paragraph.
- B.) Rejected claims 1 and 5 under 35 U.S.C. §103(a) as being unpatentable over *Sekine et al.* in view of *Miyakawa*.
- C.) Rejected claims 3 and 4 under 35 U.S.C. §103(a) as being unpatentable over *Sekine et al.* in view of *Miyakawa* and further in view of *Ishihara*.
- D.) Rejected claims 6 and 7 under 35 U.S.C. §103(a) as being unpatentable over *Sekine et al.* in view of *Miyakawa* and further in view of *Tabita*.
- E.) Rejected claim 2 under 35 U.S.C. §103(a) as being unpatentable over *Sekine et al.* in view of *Miyakawa* and further in view of *Ishihara* and *Tabata et al.*

Applicant respectfully traverses the rejection and addresses the rejections as follows:

- A.) Rejection of claim 7 under 35 U.S.C. §112, second paragraph:

Claim 7 has been amended as per the Examiner's request to overcome the rejection.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKING TO SHOW CHANGES MADE".

Applicant respectfully submits the rejection has been overcome and requests that it be withdrawn.

B.) Rejection of claims 1 and 5 under 35 U.S.C. §103(a) as being unpatentable over *Sekine et al.* in view of *Miyakawa*:

Applicant respectfully disagrees with the rejection.

Claims 1 and 5 have each been amended to clarify the claimed device with the plurality of image capturing regions is a single solid-state image-sensing device.

Referring to Applicant's Figure 1 for illustrative purposes, Applicant's independent claim 1 as amended claims a three-dimensional image-capturing apparatus comprising a single solid-state image-sensing device 1 having a plurality of image capturing regions 1a, 1b. A plurality of optical systems are for forming images of a subject in the image-capturing regions. Each one of the optical systems corresponds to a different one of the image-capturing regions 1a, 1b. The optical systems include a plurality of reflection means 5a, 6a, 5b, 6b for reflecting rays from the subject a number of times. At least a lens 3a, 3b is provided to be closer to the single solid-state image-sensing device 1 than the closest reflection means 6a, 6b to the subject among the reflection means 5a, 6a, 5b, 6b. The reflection means 5a, 6a, 5b, 6b and the lenses 3a, 3b of the optical systems are used to form, in the corresponding image-capturing regions 1a, 1b, separate images of the subject which are captured from different viewpoints having a distance therebetween.

Therefore, claim 1 claims a three-dimensional image-capturing apparatus that has a single solid-state image-sensing device having a plurality of image-capturing regions. A different optical system is associated with each image-capturing region to beneficially provide a three-dimensional image.

This is clearly unlike *Sekine et al.* in view of *Miyakawa*. As acknowledged by the Examiner, *Sekine et al.* fails to disclose a single solid-state image-sensing device with a plurality of image-capturing regions. Instead, *Sekine et al.* discloses two CCD devices 121, 122 each with one image capturing region. Therefore, the Examiner combines *Sekine et al.* with *Miyakawa*, however, Applicant respectfully submits that *Sekine et al.* in view of *Miyakawa* still fails to disclose or suggest claim 1.

Miyakawa discloses a single camera 40 with one image-capturing region. As clearly shown in *Miyakawa* Figure 1, *Miyakawa* merges two different optical paths at mirror 25 before they reach the camera 40. Using shutters 24 and 27, only one of the optical paths is projected at a time through the mirror 25 and into the camera 40. Thus, as clearly shown, optical path 1 is projected onto the camera's 40 image-capturing region and then optical path 2 is projected onto the camera's 40 same image-capturing region. Unlike Applicant's claim 1, nowhere does

Miyakawa disclose or suggest a plurality of image-capturing regions associated with different optical paths.

The Examiner states that *Miyakawa* discloses a plurality of image-capturing regions, however, Applicant strongly disagrees. *Miyakawa* discloses a CCD camera that has a plurality of light receiving elements 42, however, these are not image-capturing regions in the same sense as in claim 1. As claimed in claim 1, separate images are formed in different image-capturing regions. This is unlike *Miyakawa*, wherein separate images are received by all of *Miyakawa*'s light receiving elements 42. That is all of *Miyakawa*'s light receiving elements 42 form only one image-capturing region.

Therefore, Applicant respectfully submits that the Examiner has used improper hindsight to argue that the combined references disclose or suggest claim 1. *Sekine et al.* discloses two CCD devices each with one image-capturing region. And *Miyakawa* discloses one CCD device with one image-capturing region. It would not have been obvious to one having skill in the art to combine *Sekine et al.*'s two CCD cameras with *Miyakawa*'s one CCD camera (each with one image-capturing region) to arrive at Applicant's one device having a plurality of image-capturing regions.

Therefore, for at least this reason *Sekine et al.* in view of *Miyakawa* fails to disclose or suggest claim 1.

Further, Applicant respectfully submits that there would have been no motivation to combine *Sekine et al.* with *Miyakawa*. Referring to *Sekine et al.* Figure 1, *Sekine et al.*'s system discloses two light beams that are orthogonal to each other in the optical unit 120. Using *Sekine et al.*'s optical system, it would not be possible to transmit *Sekine et al.*'s two orthogonal light beams onto *Miyakawa*'s single camera 40. In fact, *Miyakawa* purposefully alternates its two optical paths through its mirror 25 so that its optical paths are not orthogonal. Thus, it would not be possible to use *Sekine et al.*'s system with *Miyakawa*'s camera to provide a three-dimensional image.

Accordingly, *Sekine et al.* in view of *Miyakawa* fails to disclose or suggest claim 1.

Claim 5 depends directly or indirectly from claim 1 and is therefore allowable for at least the same reasons that claim 1 is allowable.

Applicant respectfully submits the rejection has been overcome and requests that it be withdrawn.

C.) Rejection of claims 3 and 4 under 35 U.S.C. §103(a) as being unpatentable over *Sekine et al.* in view of *Miyakawa* and further in view of *Ishihara*:

Applicant respectfully disagrees with the rejection.

Independent claim 1 is allowable over *Sekine et al.* in view of *Miyakawa* as discussed above. *Ishihara* still fails to disclose or suggest a single solid-state image-sensing device having a plurality of image-capturing regions, wherein a different optical system is associated with each image-capturing region.

Therefore, *Sekine et al.* in view of *Miyakawa* and further in view of *Ishihara* fails to disclose or suggest claim 1.

Claims 3 and 4 depend from claim 1 and are therefore allowable for at least the same reasons that claim 1 is allowable.

Applicant respectfully submits the rejection has been overcome and requests that it be withdrawn.

D.) Rejection of claims 6 and 7 under 35 U.S.C. §103(a) as being unpatentable over *Sekine et al.* in view of *Miyakawa* and further in view of *Tabita*:

Applicant respectfully disagrees with the rejection.

Regarding claim 6:

Independent claim 1 is allowable over *Sekine et al.* in view of *Miyakawa* as discussed above. *Tabita* still fails to disclose or suggest a single solid-state image-sensing device having a plurality of image-capturing regions, wherein a different optical system is associated with each image-capturing region.

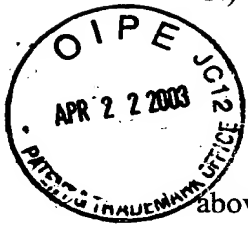
Therefore, *Sekine et al.* in view of *Miyakawa* and further in view of *Tabita* fails to disclose or suggest claim 1.

Claim 6 depends from claim 1 and is therefore allowable for at least the same reasons that claim 1 is allowable.

Regarding claim 7:

Similar to claim 1, claim 7 as amended claims a single solid-state image-sensing device having a plurality of image-capturing regions. A different optical system is associated with each image-capturing region to beneficially provide a three-dimensional image.

As described above with reference to claims 1 and 6, *Sekine et al.* in view of *Miyakawa* and further in view of *Tabita* fails to disclose or suggest this claimed subject matter. Therefore,



Sekine et al. in view of *Miyakawa* and further in view of *Tabita* fails to disclose claim 7 for at least the same reasons that the combined reference fail to disclose or suggest claim 1.

Applicant respectfully submits the rejection has been overcome and requests that it be withdrawn.

E.) Rejection of claim 2 under 35 U.S.C. §103(a) as being unpatentable over *Sekine et al.* in view of *Miyakawa* and further in view of *Ishihara* and *Tabata et al.*:

Applicant respectfully disagrees with the rejection.

Similar to claims 1 and 7, claim 2 as amended claims a single solid-state image-sensing device having a plurality of image-capturing regions. A different optical system is associated with each image-capturing region to beneficially provide a three-dimensional image.

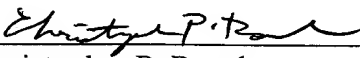
As described above with reference to claims 1 and 7, *Sekine et al.* in view of *Miyakawa* and further in view of *Tabita* and *Ishihara* fails to disclose or suggest this claimed subject matter. Therefore, *Sekine et al.* in view of *Miyakawa* and further in view of *Tabita* and *Ishihara* fails to disclose claim 2 for at least the same reasons that the combined reference fail to disclose or suggest claim 1.

Applicant respectfully submits the rejection has been overcome and requests that it be withdrawn.

CONCLUSION

In view of the foregoing, it is submitted that claims 1-7 are patentable. It is therefore submitted that the application is in condition for allowance. Notice to that effect is respectfully requested.

Respectfully submitted,

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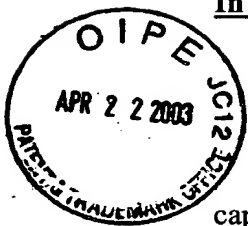
In the Claims:

Please amend claims 1, 2, 3, 4, 5 and 7 as follows:

1. (Three Times Amended) A three-dimensional image-capturing apparatus comprising:
a single [image-capturing] solid-state image-sensing device having a plurality of image
capturing regions; and

a plurality of optical systems for forming images of a subject in the image-capturing
regions, each one of the optical systems corresponding to a different one of the image-capturing
regions, the optical systems including a plurality of reflection means for reflecting rays from said
subject a number of times, and at least a lens provided to be closer to said single [image-
capturing] solid-state image-sensing device than the closest reflection means to said subject
among the reflection means;

wherein the reflection means and the lenses of the optical systems are used to form, in the
corresponding image-capturing regions, separate images of said subject which are captured from
different viewpoints having a distance therebetween.



2. (Four Times Amended) A three-dimensional image-capturing apparatus comprising:
a single [image-capturing] solid-state image-sensing device;
a plurality of imaging-side reflection means having reflectors provided to be obliquely outward, each one of the imaging-side reflection means corresponding to one of a plurality of different portions of an image-capturing region of said single [image-capturing] solid-state image-sensing device;
a plurality of subject-side reflection means having reflectors provided outer from the imaging side reflection means so as to be oblique with respect to a subject, each one of the subject-side reflection means corresponding to a different one of the imaging-side reflection means, the subject-side reflection means reflecting rays from said subject to the corresponding imaging-side reflection means;
a plurality of lenses or lens units provided to be closer to said single [image-capturing] solid-state image-sensing device than the subject-side reflection means in optical paths formed from said subject to the different portions of the image-capturing region so that rays from said subject to the different portions of the image-capturing region are reflected by the imaging-side reflection means through the lenses or lens units, each one of the [lens] lenses or lens [unit] units corresponding to a different one of the different portions of the image-capturing region, the lenses or lens units forming a plurality of images of said subject which have parallax; and
a plurality of diaphragms, each one of the diaphragms corresponding to a different one of the lenses or lens units, in which when each optical path has a lens, the diaphragms are provided to be closer to said subject than the corresponding lens and in which when each optical path has a lens unit, the diaphragms are provided to be closer to said subject than a lens of the corresponding lens unit.

3. (Amended) A three-dimensional image-capturing apparatus according to Claim 1, further comprising a light-shielding means provided at least between the [image-capturing] single solid-state image-sensing device and the reflection means so as to separate the optical systems for forming images of said object.

4. (Amended) A three-dimensional image-capturing apparatus according to Claim 1, further comprising light-limiting means provided to be closer to said subject than the reflection means for the $(2n-1)$ -th reflection (where n represents a positive integer) from said [image-capturing] single solid-state image-sensing device along the optical systems, wherein the light-limiting means prevent incidence of flux of ambient light outer from rays forming each image of said subject.

5. (Amended) A three-dimensional image-capturing apparatus according to Claim 1, further comprising a signal processing means for dividing a video signal from said [image-capturing] single solid-state image-sensing device into video signals representing the images of said subject captured in the image-capturing regions for capturing images of said subject from the different viewpoints.

7. (Three Times Amended) A stereo-camera recording/reproducing systems comprising:
a three-dimensional image-capturing apparatus comprising a single [image-capturing] solid-state image-sensing device having a plurality of image-capturing regions and a plurality of optical systems, each one of the optical systems for forming an image of a subject in a different corresponding one of the image-capturing regions;

a timing generator for driving said three-dimensional image-capturing apparatus so as to output the images formed in the image-capturing regions in the form of a single video signal;

a driver;

a camera signal processor for implementing camera signal processing on the single video signal;

a signal recorder for recording, on a single recording medium, the processed video signal output from said camera signal [process] processor;

a single reproducer for reproducing the video signal recorded on the recording medium;

a video separating circuit for separating the reproduced video signal from the reproducer into signals corresponding to the image-capturing regions; and

display apparatus for displaying the signals corresponding to the image-capturing regions, which are output from said video separating circuit;

wherein the optical systems include a plurality of reflection means for reflecting rays from said subject a number of times and at least a lens provided to be closer to said [image capturing]

single solid-state image-sensing device than the reflection means closest to said subject, each one of the reflection means corresponding to a different one of the image-capturing regions, and wherein the reflection means and the lenses are used to form, in the corresponding image-capturing regions, separate images of said subject which are captured from different viewpoints having a distance therebetween.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited as First Class Mail in an envelope addressed to Asst. Commissioner for Patents, Washington, D.C. 20231 on April 16, 2003.



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